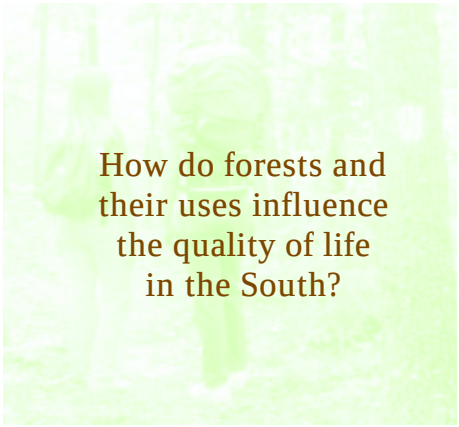

How do forests and their uses influence the quality of life in the South?

Chapter 12: Forests and the Quality of Life

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Key Findings

■ Indicators of economic conditions were negatively correlated with areas of concentrated employment in the forest products industry. Industrial concentration in the pulp and paper sector and the primary wood products sector was negatively correlated with median household income and the proportion of the population completing high school and positively correlated with unemployment and poverty rates. Further, industrial concentration in these sectors was negatively correlated with population growth and other indicators of economic development such as concentrated employment in the finance, insurance, and real estate sector. The degree to which the pulp and paper sector and the primary wood products sector influenced prevalent economic conditions cannot be easily determined.

■ The forest products industry provided good paying jobs relative to other economic sectors in areas where the forest products industry was located. On average, income per job in this industry ranged from marginally higher (in the primary and secondary wood products sectors) to much higher (in the pulp and paper sector) than average income per job for typical sources of employment.

■ Indicators of social conditions were mixed with respect to employment in the forest products industry. For example, industrial concentration in this industry was positively correlated with the proportion of owner-occupied housing and the proportion of the population that voted in presidential elections and was negatively correlated with rates of crime and divorce. However, industrial concentration was negatively correlated with the percent of the population graduating from high school and, in the case of the primary wood products sector, was positively correlated with infant mortality rates. The degree to which the forest products industryinfluenced prevalent social conditions cannot be easily determined.

■ Through the export of wood products to other regions, the forest products industry contributed to local economies by bringing in income, which then circulated through economies via the purchase of locally provided goods and services. The forest products industry also contributed to the local tax base of communities via income and property taxes.

■ Forest amenities were impacted in areas with concentrated employment in the pulp and paper sector and the primary wood products sector. Concentrated employment in these sectors was correlated with various indicators of an increasingly industrialized forest, including higher concentrations of plantation acreage, younger pine forests, and greater timber harvest intensity in hardwood forests.

■ The forest related recreation and tourism sector was concentrated in areas with more natural forest conditions. Increasing concentration of employment in this sector was correlated with higher proportions of upland hardwood forests, older forests, and forests where harvest pressure was less intense.

■ Areas of concentrated employment in the forest related recreation and tourism sector were correlated with better economic conditions and relatively higher levels of economic development. An increase in the degree of concentration in this sector was correlated with an increase in median household income; an increase in the rate of high school graduation; a decline in unemployment and poverty rates; an increase in employment concentration in the finance, insurance, and real estate sector; an increase in employment in the retail and wholesale sectors; and an increase in the rate of population growth. However, increased concentration in this industry was also correlated with an increase in the crime rate. Thus, areas of concentrated employment in the forest related recreation and tourism sector face different economic development challenges than do areas of concentrated employment in the wood fiber-based forestry sectors.

■ Competing demands on southern forests will likely increase as timber production intensifies in the South due to the region's competitive advantage in timber growing and as people continue to move to locations in the South that provide natural forest amenities. In some areas these trends will intensify the social, political, and ideological tension related to forest use. And in some areas, quality of life for residents may decline where forests with natural amenity values come under increased pressure for timber harvest and intensified forest management.

Introduction

Quality of life is a multidimensional concept that is similar to and often used interchangeably with the terms "well-being," "welfare," and "standard of living." The term "quality of life" refers to a summary measure of well-being, where the locus of well-being is the individual members of society. This frame of reference presents analysts with substantive difficulties, because there is no generally accepted theoretical model to guide analyses. The lack of a theory of what constitutes "the good life" derives from the fact that the way in which people identify and integrate the important domains of their lives are generally unknown (Mukherjee 1989, Wish 1986). Quality-of-life indicators are typically chosen based on intuition (Bayless and Bayless 1982, Diener 1995) and ease of data collection (Power 1980). Further, the means by which the well-being of individuals can be meaningfully aggregated to represent social welfare is not a simple matter (e.g., see Arrow 1983), and how well off one is in society relative to others may be more important than any absolute measure (Easterlin 1974).

To provide the reader with a better sense of how the quality-of-life concept has been treated in major studies, we briefly review some well-known indices. This leads us to a consideration of how forests contribute to the quality of life in the South.

Well-Known Indices of the Quality of Life

One of the most widely known indicators of the quality of life is the Human Development Index of the United Nations Development Program (United Nations Development Program 1998). The Human Development Index combines national indicators of income, life expectancy, and education into a single number. [This is accomplished by: (1) computing a standard score for each component indicator by country (where the standard score measures the difference between a country value and the maximum value divided by the range of values across countries), and (2) summing the standard component scores for each country.] This procedure results in a measure that allows countries to be ranked by the summary index and allows comparisons to be made across countries regarding quality of life.

Within the United States, there is concern among social scientists that "more" does not unambiguously imply "better," that social costs may increase along with economic growth, and that economic measures alone provide a biased estimate of how well the people of the United States are doing. A number of indicators of social progress have been developed that adjust standard economic measures to account for social and environmental conditions. One such model is the Genuine Progress Indicator that includes measures of such things as personal consumption, income distribution, value of housework and parenting, cost of crime, loss of old-growth forests, and loss of leisure time (Cobb and others 1995a, 1995b). Values for the component indicators are summed up to produce a summary measure that is tracked over time to indicate trends.

Within the private sector, use of the quality-of-life concept is evidenced by the popularity of rankings of the best places to live, work, or do business based on multidimensional scales of well-being (e.g., see Boyer and Savageau 1981, Garoogian and others 1998, Morgan Quinto Corporation 1998). These indices use arbitrary methods for selecting and combining component indicators for wide-ranging measures of quality of life such as income, pollution, taxes, quality of public schools, and number of women-owned businesses.

Thus, we can see that summary measures of the quality of life are used to make comparisons, either across different places at a given point in time or over time for given locations (Dasgupta 1999). These data allow analysts to evaluate trends, anticipate future conditions of social well-being, and determine how well certain locations are doing relative to other places. However, significant methodological issues remain regarding how to select component measures and the appropriate weights to be placed on components in creating a summary index. In this chapter, we attempt to bypass some of these methodological problems by using an array of indicators that are not meant to be additive but rather provide a pluralistic view of the elements which enter into an assessment of forests and quality of life. [This disaggregate approach, focusing attention on a set of component indicators, is also used in assessments of the social health of the Nation (e.g., see Miringoff and Miringoff 1999).]

Forest Related Indicators

In this chapter, we present three classes of indicators related to forests and the quality of life: (1) economic, (2) social and demographic, and (3) forest amenities. The rationale for including each class follows.

Economic indicators—Recent studies have shown that income is highly correlated with various indices of the quality of life (Dasgupta 1999, Diener 1995, Ferriss 2000). Although correlation does not imply causation, these results suggest that economic variables are useful in providing measures of well-being and should be included in quality-of-life analyses.

From a forestry perspective, forests provide jobs and income to people who grow, harvest, and process timber as well as other nontimber forest products such as pine straw, wild edibles, and medicines. Forests also provide natural settings for outdoor recreation. Whether providing inputs to the forest products or recreation industries, forests contribute to quality of life by providing income and employment, particularly in rural areas where other economic opportunities may be limited.

Some people have argued that the contribution of the productive aspect of forests to quality of life is greater than simply the jobs created in the forest products sector. This argument maintains that the forest products industry is an important engine for economic growth in forested regions (e.g., see Schallau 1994). This view is formalized with the economic base model which argues that through the export of goods and services, basic industries bring in money from outside of the local economy, which stimulates job creation in the local sector through spending patterns on local goods and services. The forest products industry also contributes to the local tax base of communities via income and property taxes.

Does the export of timber products outside of local economies enhance

the quality of life for other participants in the local economy? Although this question is not easily answered, it is useful to consider some of the limitations of the economic base model that have been articulated by forest policy analysts (Crone and others 1999, Niemi and Whitelaw 1999, Power 1996). It has been argued that if basic industries have a detrimental impact on the local environment, this would decrease the well-being of people who live there. Because impacts of industry on the natural environment are not included in economic base calculations, failure to account for such impacts imparts a bias to quality-of-life assessments. In addition, the economic base model focuses attention on the export of goods and services outside a region, but does not consider the flow of money generated by people who are attracted to an area because of its natural amenities (English and Bergstrom 1994). This omission includes people who visit an area for recreation and tourism purposes as well as people who decide to move to an area because of the quality of the natural amenities found there.

Social and demographic indicators—Social indicator research has been applied to issues related to rural development (e.g., see Richmond and others 2000) and forest-dependent communities (e.g., see Parkins 1999). A widely cited study conducted in the Northeast United States concluded that "Forest communities are among the least prosperous of all rural communities; standards of health and happiness tend to be lower than average; while family status is high, divorce rates are very high, housing and public services and amenities are poor; economic stability is low, with high seasonal unemployment, high rates of population turnover and poor wages and earnings" (Drielsma, J.H. 1984. The influence of forest-based industries on rural communities. Unpublished Ph.D. dissertation. On file with: Yale University, New Haven, CT). While conditions in northeastern forest communities cannot be used to characterize forest related communities in the South, this conclusion motivates the need for a regional assessment of social and demographic variables.

In the United States, recent empirical studies provided evidence that rapid rural population growth has not resulted from growth of extractive industries or manufacturing but rather has resulted from the attractiveness of natural environments (Deller and others 2001, English and others 2000). Johnson and Beale (1994) found that during the early 1990s, the fastest growing counties in the United States were nonmetropolitan counties that were destinations for retirement-age migrants or were recreation centers. Of the 285 counties identified as recreational, 47 (16 percent) are located in the South (Beale and Johnson 1998). Although some of these southern counties are attracting in-migrants because of their proximity to the coast, many southern recreational counties experiencing rapid growth are found in forested areas such as the Southern Appalachian Mountains and the Ozark-Ouachita Highlands.

Forest amenity indicators—Forests provide a broad array of amenity services. Amenity values are usually thought to derive from the visual qualities of landscapes, although they may also arise from appreciation for ecosystem integrity and health (Gobster 1999). Because appreciation of forest amenities is subjective, the measurement of amenity value is difficult. However, natural resource and environmental economists have developed and formalized the view that the natural World provides benefits to members of society that are not accounted for in markets, and that people are willing to pay for enhancements in the quality of natural environments (e.g., see Freeman 1993, Krutilla and Fisher 1985). The theory and measurement of nonmarket values provides a useful perspective for understanding linkages between forest amenities and the quality of life.

The theory of nonmarket valuation and willingness to pay is based on a concept referred to as "consumer surplus," or the value of something above and beyond what is actually paid for it. Applied to the natural World, this concept can be represented by the metaphor "real income": "When the existence of a grand scenic wonder or a unique and fragile ecosystem is involved, its preservation and continued availability are a significant part of the real income of many individuals" (Krutilla 1967, p. 779). In a footnote to this remark, Krutilla goes on to state that "These would be the spiritual descendants of John Muir, the present members of the Sierra Club, the Wilderness Society, National Wildlife Federation, Audubon Society and others to whom the loss of a species or the disfigurement of a scenic area causes acute distress and a sense of genuine relative impoverishment." Using a somewhat different metaphor, Niemi and Whitelaw (1999) compare consumer surplus to a second paycheck that people receive as a bonus resulting from a high-quality natural environment. In a similar fashion, Power (1996) equates local economic well-being with the sum of money income (adjusted for the local cost of living) and the value of noncommercial environmental qualities.

In an attempt to analyze and quantify real income derived from natural environments, economists divide amenity values into the sum of use value and non-use value. In a forestry context, use value refers to the set of values derived from the direct use of forest environments for activities such as timber harvesting, recreation, hunting, fishing, wildlife viewing, and wild food collection. Non-use values are values not associated with current use and include such non-uses as maintaining the option to personally use part of the natural environment in the future (option value), leaving part of the natural environment for others to use in the future (bequest value), and the knowledge that part of the natural environment will continue to exist even if the individual holding this value never contemplates using it (existence value) (Krutilla 1967).

One of the major nonmarket benefits provided by forests is opportunities for outdoor recreation and leisure (e.g., see Cordell and Bergstrom 1999; Driver and others 1991, 1996). Recreation, wildlife, and fishing activities provided the major sources of benefits from national forests in the South (Pearse and Holmes 1993). In addition, recent studies concluded that non-use values of forest ecosystems are important sources of value to society as well (Haefele and others 1991, Holmes and Kramer 1996, Kramer and others 2002, Walsh and others 1990).

Nonmarket forest valuation studies have concluded that social welfare is

greatest when forest protection and forest use are balanced (Boyle and Teisl 1999, Boyle and others 2001, Garrod and Willis 1997). However, the public has demonstrated concern with specific timber harvesting practices, especially clearcutting. For example, in a recent study of timber harvesting preferences of Maine residents, it was found that harvest prescriptions that left 153 or 459 trees live trees per acre were significantly preferred to prescriptions that left no trees remaining after harvest (Boyle and Teisl 1999, Boyle and others 2001, Holmes and Boyle 2002). This research finding is in concert with the announcement made by the Chief of the USDA Forest Service in 1992 that the Agency would drastically reduce the area subject to clearcutting in national forests (Backiel and Gorte 1992).

Public concern over clearcutting as a timber harvest and/or regeneration method presages the potential for ideological tension in the South between people holding those concerns and people who grow, harvest, and process timber and timber products (e.g., see American Forest & Paper Association 1994, Devall 1993). We see no a priori reason that public concern with clearcutting on public forests will not manifest as concern over even-aged management practices on private forests. Because private forests produce public goods in terms of benefits such as clean water, wildlife habitat, and scenic views, the perceived impairment or loss of such benefits will cause a loss of real income to people who value those forest amenities.

Methods

Defining "Forest Dependence"

One of the concerns brought forward by the public was a better understanding of the linkage between "forest dependency" and various indicators of the quality of life. In general, the concept of forest dependency is focused on the degree of concentration of a particular industry in a particular area.

Given this framework, analysts often proceed to a determination of dependent communities by identifying communities that exceed a given, arbitrarily imposed, dependency threshold. For example, in a recent study of rural areas in the United States, farming-dependent counties were defined as counties that had 20 percent or more of labor and proprietor income derived from farming (Cook and Mizer 1994). In another study, recreation dependence was defined as having at least 10 percent of total employment in eating and drinking establishments, hotels and other lodging, and amusement parks (Ross and Green 1985).

Linking Forest Dependence with Other Indicators

For the purposes of this chapter, we treat forest dependence as a continuous variable and focus attention on job (rather than wage) dependency. This perspective allows us to examine how variation in the level of concentration of forest related employment relates to variation in quality-of-life indicators. This is accomplished using Pearson's correlation coefficient (e.g., see Kalbfleisch 1985). In so doing, we stress that correlation does not imply causation, but rather indicates whether an increase in some variable is associated with an increase or decrease in another variable, or if two variables are independent. Further, this method allows us to determine the strength of the relationship between two variables. The correlation coefficient is constrained to fall between 1 and –1, and the closer the coefficient is to 1 in either direction, the stronger the linear relationship. Finally, the statistical analysis allows us to determine whether or not correlations are statistically significant (that is, statistically different than zero).

To evaluate linkages between industrial concentration (forest dependence) and various quality-of-life indicators, relevant comparisons can only be made between areas where specific industries are located. Thus, we exclude areas that do not support particular forest related industries from the correlation analysis.

Correlation analysis provides insight into cross-sectional trends in indicator variables within specific forest related industries. This approach is preferred to a simple comparison of indicator variables across forest sectors, because a confounding factor across sectors is population density. That is, differences in indicator variables across sectors may simply reflect differences in population density.

Forest Related Sectors

We focus attention on four forest related sectors that we subsequently refer to as the primary wood products sector, the secondary wood products sector, the pulp and paper sector, and the forest related recreation and tourism sector. The primary wood products sector comprises the following subsectors: (1) forest products (stumpage, pulpwood, fuel wood, Christmas trees, and fence posts), (2) logging camps and logging contractors, (3) sawmills and planing mills, (4) hardwood dimension and flooring mills, (5) special products, and (6) veneer and plywood. The secondary wood products sector comprises the following subsectors: (1) millwork, (2) wood kitchen cabinets, (3) structural wood members, (4) wood containers, (5) wood pallets and skids, (6) prefabricated wood buildings, (7) wood preserving, (8) reconstituted wood products, (9) wood products not included elsewhere, (10) wood household furniture, (11) wood TV and radio cabinets, (12) household furniture not included elsewhere, (13) wood office furniture, (14) wood partitions and fixtures, (15) furniture and fixtures not included elsewhere, (16) paperboard containers and boxes, (17) paper coating and laminated packaging, (18) coated and laminated paper not included elsewhere, (19) paper bags, (20) die-cut paper and board, (21) sanitary paper products, (22) envelopes, and (23) stationery products. The pulp and paper sector comprises the following subsectors: (1) pulp mills, (2) paper mills except those producing building paper, and (3) paperboard mills.

The forest related recreation and tourism sector is more difficult to define than the other forest related sectors. This is because the attribution of recreation and tourism activities to use of the forest is not straightforward, and data that might directly link recreation and tourism to forest-based activities are not available. Prior studies that attempted to identify recreation-dependent areas used arbitrary dependence thresholds (Ross and Green 1985) or more sophisticated criteria (Beale and Johnson 1998). One study demonstrated a statistical

linkage between a number of variables, including public and private forest land and export employment in tourism-related sectors (English and others 2000). However, none of these studies provides a means of identifying specific areas in the South that have forest related recreation and tourism employment. Consequently, it was necessary to construct data that were consistent with this objective.

For the purposes of this chapter, the recreation and tourism sector comprises the following subsectors: (1) hotels and lodging, (2) eating and drinking establishments, (3) amusement and recreational services not included elsewhere, and (4) sporting and athletic goods not included elsewhere. A linkage between forests and recreation and tourism activity was then specified by imposing the criterion that forest land, as a percent of total land area, must equal or exceed the average for the South (58 percent). This rationale was used because areas meeting this criterion had greater-than-average land use in forests. A second criterion was included to exclude metropolitan areas from the forest related recreation sector. Imposition of these two criteria effectively excluded areas such as Disney World, Myrtle Beach, metropolitan areas, and developed areas along interstate highways from the analysis of forest related recreation and tourism.

Linking Forest Dependence and Economic Structure

A second concern brought forward by the public was to develop a better understanding of the linkages between different uses of the forest and economic structure. To maintain consistency with our focus on industrial concentration, we examined the correlation between forest dependency (industrial concentration in the four forest related sectors described earlier) and industrial concentration (the ratio of employment in each industrial sector to total employment in an area) in the following sectors: (1) agriculture; (2) mining; (3) construction; (4) manufacturing; (5) trade; (6) wholesale; (7) retail; (8) finance, insurance, and real estate; and (9) service and government. Again, it is important to emphasize that correlation (estimated using the Pearson correlation coefficient) does not imply causation. However, correlation analysis does allow patterns to be observed linking the degree of industrial concentration in forest related sectors and other industrial sectors. A description of such patterns provides preliminary evidence for future research that may seek to develop cause-and-effect relationships describing economic structure. However, the development of cause-and-effect relationships is beyond the scope of this chapter.

Specific Indicators Used in the Analysis

Income per job—Specific quality-of-life indicators were selected based on consideration of the issues discussed in the Introduction. To provide an indication of the economic benefit received by people working in forest related industries, total income per sector was divided by the number of jobs per sector for the four forest related sectors described earlier. These measures are not wage rates but represent average income per job. Income per job may be low because wage rates are low or because the typical job is only part time. Income per job was also computed for all jobs in the areas where the forest related sectors were located. This allowed a comparison to be made between average income per job in the forest related sectors and the typical job in those areas.

Economic, social, and demographic indicators—To evaluate quality-of-life indicators in areas with forest related employment, a subset of social, demographic, and economic variables were selected from two recent quality-of-life studies (Diener 1995, Ferriss 2000). From the socioeconomic and demographic indicators used in those studies, the following indicators were selected: (1) infant mortality rate, (2) violent crime rate, (3) median household income, (4) unemployment rate, (5) poverty rate, and (6) percent graduating high school.

Evidence in the literature that rural population growth is influenced by the supply of natural amenities caused us to include a measure of population growth in the analysis. Inclusion of a variable measuring the percent change in population allowed us to evaluate the relationship between the degree of industrial concentration in forest related industries and population dynamics.

Social cohesion is a concern in considering quality of life. The following indicators of social cohesion and the potential for collective social action used in other quality-of-life studies (Drielsma 1984; Hamilton 1993, 1999; Wish 1986) were included: (1) percent of owner-occupied housing, (2) divorce rate, and (3) percent voting in recent presidential elections (an indicator of the potential for collective action).

Forest amenity indicators—A number of variables were selected to provide a general description of the forest landscape: (1) forest land as a percent of all land, (2) pine forest acreage as a percent of total forest acreage, (3) upland hardwood acreage as a percent of total forest acreage, (4) bottomland hardwood acreage as a percent of total forest acreage, and (5) oak-pine acreage as a percent of total forest acreage. Correlations between the degree of industrial concentration in various forest related sectors and these descriptive variables provide us with a general sense of the forest types within which the sectors were concentrated.

The review of the literature linking willingness to pay and forest amenities led us to include variables that would indicate the degree of naturalness of forest ecosystems. Although naturalness may not be possible to define with precision, some aspects can be specified. Anderson's (1991) definition of "natural" was based on the idea that forests that are more natural would change little if removed from human influence and are made up of a high proportion of native species. Noss and Cooperrider (1994) used this idea to define a gradient of forest ecosystem naturalness that ranged from primary natural forests (virtually uninfluenced by human disturbance) to secondary natural forests (natural regeneration after human disturbance) to plantations (human planting after human disturbance).

Using these ideas as broad descriptors of the degree of naturalness, we decided that the following indicators of human disturbance in forest ecosystems should be included: (1) plantation acreage as a percent of all forest acreage,

(2) the change in plantation percent between the two most recent forest surveys, (3) pine removal to pine inventory ratio, (4) pine growth to pine inventory ratio, (5) hardwood removal to hardwood inventory ratio, and (6) hardwood growth to hardwood inventory ratio. The first indicator provides information on the extent of intensive forest management in an area, while the second indicator provides information on the rate of growth of intensive forestry. Removal of pine or hardwood as a proportion of the standing inventory provides information on harvest intensity. Growth as a proportion of standing inventory provides information on the age distribution of forests. Because young forests generally grow more rapidly than old forests, a high/low growth-to-inventory ratio would be found in areas with younger/older forests.

Data Sources

Four sources of data were used in the analyses. All units of observation were at the county level.

First, data on forest variables were obtained from the Forest Inventory and Analysis (FIA) unit of the USDA Forest Service Southern Research Station on May 26, 1998. The FIA unit conducts periodic forest inventories that rotate throughout the South. Data were not available for all southern counties at the same point in time, so data from the most recent survey were used to provide the most current representation of forest conditions. For one variable, change in plantation acreage, the two most recent forest surveys were used to compute the percent change. Because Kentucky was not included in forest surveys conducted by the FIA unit, forest variables for this State were not directly comparable with other Southern States and were thus not included in the analyses.

The reader should be alerted to the fact that FIA data were sampled in a way to meet sampling error standards at the State level. As data are subdivided into smaller geographical units, such as the county level used in this chapter, the sampling errors increase, and the reliability of the estimates decreases. This may impact the analysis reported in this chapter primarily by increasing the size of the standard errors associated with the Pearson correlation coefficients where such correlations were estimated using forest variables. In turn, an increase in the standard errors associated with correlation coefficients suggests that some relationships that may in fact be statistically significant will not meet the 10-percent significance threshold for reporting in this chapter. However, we do not anticipate this effect will bias the estimated correlations or cause some correlations to appear statistically significant when in fact they are not.

Second, data on employment and income were obtained from the IMPLAN Database (Minnesota IMPLAN Group 1997). To make these data as comparable as possible with data from the most recent census data that were available when the analysis was undertaken (1990), we used 1993 IMPLAN data. Employment data in the IMPLAN Database are created from the Bureau of Labor Statistics ES202 data, the County Business Pattern data provided by the U.S. Department of Census, and the Regional Economic Information System data provided by the Bureau of Economic Analysis. It should be noted that these data are based on where people worked (where the industrial sectors were located), not on where they resided. However, across the entire South, a discrepancy between the county where people worked and where they resided should not be an important issue.

Data on a number of social and economic indicators were obtained from 1990 Bureau of Census data sets. These indicators included: median household income, unemployment rate, poverty rate, and percent of owner-occupied housing. Of course, these data were based on where people resided.

Finally, data on a number of other social variables were obtained from the State and County Data Book (U.S. Department of Census) that was available on the Internet (http://fisher.lib.virginia.edu/ccdb/). In an attempt to align these data with other census data, we chose the most recent data that were closest in date to the 1990 census. Thus, data from the 1994 State and County Data Book were obtained for the following indicators: crime rate (serious crimes per 100,000 population, 1991), percent graduating high school (persons 25 years and older who completed at least high school, 1990), infant mortality rate (deaths of infants under 1 year per 1,000 live births, 1988), percent voting in the most recent presidential election (votes cast for president, 1992, divided by voting-age population, 1992), and percent population change (1980 to 1992).

Results

Linkages Between Forest Dependency and Forest Amenities

Correlations between employment concentration in forest related industries and indicators of forest amenities are shown in table 12.1. The strength of the correlation is greater as the value of the correlation coefficient approaches 1 or –1. A positive value indicates a positive correlation, and a negative value indicates a negative correlation. Correlation coefficients are only shown for values that were statistically different than zero at the 10-percent significance level. Also shown in the table for each statistically significant correlation coefficient is the number of observations (counties) that were used to compute the statistic.

The pulp and paper industry was located in 179 southern counties. Results shown in table 12.1 indicate that the pulp and paper sector was concentrated in heavily forested areas with higher concentrations of pine acreage, plantation acreage, new plantation acreage, and high pine growth to standing inventory ratios. Taken together, these forest indicators suggest that increasing concentration of the pulp and paper industry was correlated with an increasingly industrialized pine forest. Conversely, the results shown in table 12.1 also indicate that the pulp and paper sector was increasingly scarce in areas with higher concentrations of hardwood acreage, particularly upland hardwoods. However, in hardwood forest areas, this sector was found in increasing concentration in areas where removals of hardwoods relative to their standing inventory were high. Thus, although this sector was scarcer in hardwood forest areas than in pine forest areas, in hardwood forest areas where the pulp and paper industry had

Table 12.1—Correlation coefficients relating the level of employment concentration in forest related sectors with various indicators of forest condition (correlation coefficient only reported where statistical significance exceeded 10 percent)[a]

Variable	Pulp and paper sector		Primary wood products sector		Secondary wood products sector		Forest related recreation and tourism sector	
	Correlation coefficients							
Forest	0.19	(170)	0.40	(874)	0.14	(782)	-0.09	(414)
Pine	.20	(169)	.26	(871)				
Plantation	.25	(169)	.29	(871)			-.13	(414)
Change in plantation	.13	(169)	.24	(871)	.06	(777)	-.14	(414)
Hardwood	-.17	(169)	-.27	(871)			.09	(414)
Upland hardwood	-.15	(169)	-.19	(871)	.11	(777)	.10	(414)
Bottomland hardwood					-.13	(777)		
Oak-pine			.10	(871)				
Pine growth/inventory	.17	(164)					-.17	(405)
Pine removal/inventory							-.15	(405)
Hardwood growth/inventory			.06	(871)			-.21	(414)
Hardwood removal/inventory	.27	(169)	.24	(871)			-.19	(414)

[a] Number in parentheses is the number of counties used to compute the correlation coefficient.

become concentrated, there was a corresponding increase in hardwood harvest intensity.

The primary wood products sector was more widespread than the pulp and paper sector and was located in 978 southern counties. Results in table 12.1 indicate that the primary wood products sector was concentrated in heavily forested areas with relatively higher concentrations of pine acreage, plantation acreage, and new plantation acreage. Conversely, this industry was relatively scarce in hardwood areas, particularly in areas with high concentrations of upland hardwoods. However, concentrations of the primary wood products sector were found in areas with relatively extensive acreage in oak-pine forests. Also, within hardwood forests, increasing concentrations of the primary wood products sector were correlated with increases in harvest intensity as well as increasing forest growth rates. In sum, these indicators suggest that increasing concentration of the primary wood products industry was associated with an increasingly industrialized forest, much as was found for the pulp and paper sector.

The secondary wood products sector was located in 872 southern counties. Results in table 12.1 indicate that the secondary wood products sector was concentrated in heavily forested areas, primarily in areas with high proportions of upland hardwood forests. This result is consistent with the importance to this sector of furniture, millwork, wood containers, and pallets and skids, which are primarily based on a hardwood resource.

The forest related recreation and tourism sector (as defined in this chapter) was located in 414 counties. Results in table 12.1 indicate that the forest related recreation and tourism sector was concentrated in areas with high proportions of hardwood forests, particularly upland hardwood forests. Within hardwood forest areas, this sector was more concentrated where forests were growing relatively slowly (indicating they were older) and where harvest pressure was less intense. Within pine forests, this sector was negatively correlated with extensive forest land managed in plantations and with new plantations. Also, within pine forests, this sector was more concentrated in areas with low rates of pine growth (indicating older forests) and with less intense harvest pressure. In sum, these indicators suggest that increasing concentration of the forest related recreation and tourism sector was associated with an increasingly natural forest.

Linkages Between Forest Dependency and Social, Economic, and Demographic Indicators

Correlations between the degree of industrial concentration in forest related sectors and social, economic, and demographic indicators are shown in table 12.2. The results indicate that job dependency in the pulp and paper sector was correlated with declining levels of median household income, increasing rates of unemployment, increasing rates of poverty, and decreasing rates of high school graduation. [These results are consistent with urban-rural relationships found across the entire South (911 counties). Statistically significant correlation coefficients (at the 0.01 level or higher) were found between population density and median household income (0.41), unemployment (-0.17), poverty rate (-0.26), and educational attainment (0.43). Thus, the degree to which the pulp and paper sector, or other forest products sectors, influenced prevalent economic conditions cannot be easily determined.] Overall, these indicators

Table 12.2—Correlation coefficients relating the level of employment concentration in forest related sectors with various social, economic and demographic indicators (correlation coefficient only reported where statistical significance exceeded 10 percent)[a]

Variable	Pulp and paper sector		Primary wood products sector		Secondary wood products sector		Forest related recreation and tourism sector	
	Correlation coefficients							
Population change	-0.13	(179)	-0.21	(978)	-0.12	(872)	0.21	(414)
Unemployment	.18	(179)	.18	(978)			-.14	(414)
Median household income	-.17	(179)	-.29	(978)	-.08	(872)	.27	(414)
Living in poverty	.20	(179)	.28	(978)			-.26	(414)
Infant mortality rate			.06	(978)				
Graduating high school	-.18	(179)	-.25	(978)	-.18	(872)	.37	(414)
Serious crime rate	-.25	(179)	-.27	(978)	-.11	(872)	.29	(414)
Owner-occupied housing	.32	(179)	.24	(978)	.11	(872)	-.15	(414)
Divorce rate			-.13	(978)	-.07	(872)		
Voting-age population voting for President	.26	(179)	.20	(978)				

[a] Number in parentheses is the number of counties used to compute the correlation coefficient.

suggest that this industry was concentrated in areas with limited economic opportunities. However, areas of concentrated employment in this sector were positively correlated with the proportion of residences that were owner-occupied (providing a means of accumulating wealth) and the proportion of the population that voted in presidential elections, and a negative correlation was found with the crime rate. [These results are also consistent with the urban-rural gradient across the South. Statistically significant correlation coefficients (at the 0.01 level or higher) were found between population density and owner-occupied housing (-0.39) and crime rate (0.38). The degree to which the pulp and paper sector, or other forest products sectors, influenced prevalent social conditions cannot be easily determined.] However, the degree of industrial concentration in this sector was negatively associated with the rate of population growth. [Across the South (911 counties), a positive correlation (0.17) was found between population density and the rate of population growth (significant at the 0.0001 level.] This indicator suggests that areas of concentrated employment in the pulp and paper sector were not attracting in-migration to the degree found in areas with lower concentration of employment in this sector.

The results in table 12.2 indicate that variation in economic and social conditions across the degree of job dependency in the primary wood products sector was similar in many respects to the cross-sectional variation in economic and social conditions across the degree of job dependency in the pulp and paper sector. The degree of job dependency in the primary wood products sector was correlated with a decreasing level of median household income, an increase in the poverty rate, an increase in the rate of unemployment, and a decrease in the high school graduation rate. Increasing job dependency in this sector was positively correlated with the proportion of residences that were owner-occupied and the proportion of the population that voted in presidential elections, and a negative correlation was found with the crime rate. Although the divorce rate was found to be relatively lower in areas of concentrated employment in this sector, infant mortality rates were found to be relatively greater. Similar to the result for the pulp and paper industry, we found that the degree of industrial concentration in this sector was negatively associated with the rate of population growth.

The results in table 12.2 indicate that the variation in economic conditions across the degree of job dependency in the secondary wood products sector were similar to relationships found for the pulp and paper and primary wood products sectors. Although increasing job dependency in the secondary wood products sector was negatively correlated with median household income and the proportion of the population that had not completed high school, significant correlations with unemployment rates and the proportion of the population living in poverty were not found. A relatively high proportion of owner-occupied housing was correlated with higher concentrations of employment in this sector, and crime rates and the rate of divorce were negatively correlated with concentration in this industry. However, similar to the other wood products sectors, we found that the degree of industrial concentration in this sector was negatively associated with the rate of population growth.

The results in table 12.2 indicate that job dependency in the forest related recreation and tourism sector was positively correlated with more favorable economic indicators (despite the fact that population density was lower in counties where this sector was located than for the other forestry sectors). An increase in the degree

Table 12.3—Correlation coefficients relating the level of employment concentration in forest related sectors to the level of employment concentration in other economic sectors [a] [b]

Variable	Pulp and paper sector		Primary wood products sector		Secondary wood products sector		Forest related recreation and tourism sector	
	Correlation coefficients							
Agriculture	0.15	(179)	0.12	(978)			-0.28	(417)
Mining								
Construction			-.17	(978)			.18	(417)
Manufacturing (minus forest products)	-.22	(179)	-.13	(978)			-.15	(417)
Trade					-0.06	(872)	-.11	(417)
Wholesale	-.23	(179)	-.15	(978)	-.14	(872)	.17	(417)
Retail	-.26	(179)	-.24	(978)	-.19	(872)	.38	(417)
Finance, insurance, and real estate	-.32	(179)	-.25	(978)	-.18	(872)	.15	(417)
Service			.05	(978)	-.11	(872)	-.08	(417)
Government			.21	(978)				
Pulp and paper			.12	(978)				
Primary wood products	.26	(179)			.12	(872)	-.25	(417)

[a] Number in parentheses is the number of counties used to compute the correlation coefficient.
[b] Correlation coefficient only reported where statistical significance exceeded 10 percent.

of concentration in the forest related recreation and tourism sector was correlated with increases in median household income and with declining rates of unemployment and poverty. Although crime rates were higher and the proportion of owner-occupied homes was lower in areas where this sector was concentrated, the rate of population growth was found to increase with increasing concentration in this sector. Recall that the results shown in table 12.1 indicated that this sector was concentrated in upland hardwood forest areas that were generally older and under less intense harvesting pressure. Thus, our results are consistent with the conclusions of other studies that found rural population growth was highest for areas with high levels of natural amenities and concentrations of the recreation and tourism industry. In addition, our results suggest that forest related recreation and tourism communities are on a different development path and face different challenges than the wood fiber-based forestry sectors.

Linkages Between Forest Dependency and Economic Structure

Table 12.3 shows the correlation analysis of the degree of concentration in forest related sectors and other economic sectors. Increasing concentration of the pulp and paper industry was positively correlated with the agricultural sector. This is not surprising, as many of the pine forests in the South are found where agricultural fields were abandoned.

Increasing concentration in the pulp and paper industry was negatively correlated with a number of economic sectors including manufacturing; wholesale; retail; and finance, insurance and real estate. The generally rural location of the pulp and paper sector probably explains the relative scarcity of the wholesale and retail sectors. The relative scarcity of the finance, insurance, and real estate sector also probably reflects the lower level of economic development in areas where the pulp and paper sector was concentrated.

Two factors that are sought in locating pulp and paper plants are an available water supply (used in processing) and good access to transportation networks so that wood fiber can be procured efficiently and products can be readily shipped to market. Because the manufacturing sector also relies on good market access, it is perhaps surprising that a negative correlation was found between the pulp and paper sector and the manufacturing sector. However, this result may reflect a situation where, in locations that are close to a suitable supply of wood fiber, the pulp and paper industry is more competitive in the labor market than are other manufacturing sectors. Average income per job in the pulp and paper sector was considerably higher than average income for the typical job in areas where that sector was located (table 12.4). This is due to the large amount of industrial capital invested in the pulp and paper sector that in turn increases labor productivity.

The results in table 12.3 show that the degree of industrial concentration in the primary wood products sector was positively correlated with concentration in the agricultural sector. Again, this probably reflects the historical conversion of old fields to pine forests.

Table 12.4—Comparison of income per job in forest related sectors and typical jobs in counties where forest related sectors were located

Forest related sector	Counties where industry located	Forest related sector, income per job	Typical job, income per job
	Number	*- - - - - - Dollars per year - - - - -*	
Pulp and paper	179	54,760.00	22,211.03
Primary wood products	978	19,300.36	19,193.03
Secondary wood products	872	21,844.66	19,549.69
Forest related recreation and tourism	414	9,881.54	18,492.17

The negative correlation with wholesale and retail sectors probably reflects the rural location of this sector. The negative correlation with the finance, insurance, and real estate sector and with the construction sector reflects the relatively low level of economic development in areas where the primary wood products sector was found. Because the primary wood products sector supplies inputs to the pulp and paper sector, it was not surprising to observe a positive correlation between the two industries.

Similar to the pulp and paper sector, the negative correlation of the primary wood products sector with the manufacturing sector may indicate that this sector was more competitive in the market for labor. However, as shown in table 12.4, average income per job in the primary processing sector was only slightly higher than average income for the typical job in areas where the primary processing sector was located. However, many of the firms that constitute this industry are relatively small, such as logging contractors and sawmills. The relative independence and way of life afforded by working in this sector may be particularly appealing to members of the workforce in these rural areas.

It is important to note that the negative correlation between the pulp and paper and primary wood products sectors and the manufacturing sector suggests that the forest products industry contributes an increased share to the economic base of those areas. In the South as a whole, manufacturing constitutes the largest sector in the economic base. The substitution of forest products sectors for manufacturing suggests that in areas with concentrated employment in those forest products industries, local economies are relatively more dependent on the income and employment generated by the harvest and processing of timber and timber products.

Industrial concentration in the secondary wood products sector was negatively correlated with the wholesale and retail sectors reflecting the relatively low population density in those areas. Relatively low levels of economic development in areas of concentrated employment in the secondary wood products sector was reflected in the negative correlations with the finance, insurance, and real estate sector and with the construction sector. Because the secondary wood products sector uses inputs supplied by the primary wood products sector, it was not surprising to find a positive correlation between these two sectors.

The fact that the forest related recreation and tourism industry was positively correlated with upland hardwood forests that were older and under relatively less harvest pressure suggests that a negative correlation between this sector and the primary wood products sector would exist. This is what was found. Likewise, the concentration of the forest related recreation and tourism industry in these types of forests suggests a negative correlation with agriculture, which was also found. The higher level of economic development associated with this industry was reflected in the positive correlations with the finance, insurance, and real estate sector and the construction sector. Further, the outputs of this industry are consumed directly by consumers. The positive correlation with the retail and wholesale sectors reflects complementary consumption within those sectors and the forest related recreation and tourism sector.

Income per job in the forest related recreation and tourism sector was quite a bit less than income per typical job in the areas where that sector was found (table 12.4). This may reflect the seasonality or part-time nature of some jobs in this sector. Also, we note that some people are willing to accept lower monetary compensation to work in an industry that is located in an area where the natural amenities supply other forms of compensation contributing to real income.

Discussion and Conclusions

The forest products industry, comprising the primary and secondary wood products sectors and the pulp and paper sector, contributes to local economies in forested areas in the Southern United States. Although average job dependency (the ratio of forest sector jobs to total employment) was found to be modest, the forest products industry offered good paying jobs in areas where other economic opportunities were limited. (In counties that had forest related employment, average job dependency was 3.0 percent in the pulp and paper sector, 2.0 percent in the primary wood processing sector, 1.6 percent in the secondary wood processing sector, and 4.9 percent in the forest related recreation and tourism sector.) On average, income per job in this industry ranged from marginally higher (in the primary and secondary wood products sectors) to much higher (in the pulp and paper sector) than income per job for the typical source of employment (that is, average income per job over all sectors). By providing good paying jobs, the quality of life was enhanced for people who worked in this industry.

Through the export of wood products to other regions, the forest products industry also contributed to local economies by bringing in income to economies where the forest products industry was located and by

contributing to the local tax base. Some understanding of the contribution this industry made to local economies can be gained by considering the economic base in areas where the primary and secondary wood products sectors and the pulp and paper sector constitute at least 10 percent of total employment. Using the standard assumption that agriculture, mining, nonwood manufacturing, and the forest products industry make up the economic base (Crone and others 1999), the forest products industry accounted for about 62 percent of employment in basic industries in areas where the pulp and paper industry constituted at least 10 percent of total employment (19 counties). In areas where the primary wood products sector constituted at least 10 percent of total employment (32 counties), the forest products sector accounted for about 54 percent of employment in basic industries. In areas where the secondary wood products sector constituted at least 10 percent of total employment (14 counties), the forest products sector accounted for about 52 percent of employment in basic industries.

However, forests contributed to quality of life in the South in more ways than simply providing income and employment. For many people, enjoyment of the amenities provided by natural forest environments enhanced their quality of life. The list of forest amenities that improved the quality of life in the South include scenic views, opportunities for outdoor recreation, provision of habitat for endangered species and other wildlife, and enhancement of water quality and quantity.

One way of evaluating the contribution of forest amenities to quality of life is to consider some of the characteristics associated with forest related recreation and tourism communities. It was found that increasing concentrations of jobs in the forest related recreation and tourism sector was associated with increasing proportions of upland hardwood forests, increasing age of forests (that is, they were slower growing), decreasing timber harvesting pressure, and decreasing proportion of forest acreage in pine plantations. In general, these forest areas can be considered to be more natural, in the sense that they have received less human-induced disturbance, and provide greater levels of forest amenities.

We found that increasing concentration of employment in the forest related recreation sector was associated with better economic conditions (higher median household income and lower rates of poverty and unemployment). We also found that as the concentration of employment in the forest related recreation sector increased, population growth also increased. This result suggests that people moved to rural areas with more natural forest amenities to improve their quality of life.

Competing demands on southern forests will likely increase as timber production intensifies in the South due to the region's competitive advantage in timber growing and as people continue to move to locations in the South that provide natural forest amenities. In some areas these trends will intensify the social, political, and ideological tensions related to forest use. And in some areas, quality of life for residents may decline where forests with natural amenity values come under increased pressure for timber harvest and intensified forest management. We suggest that research, education, and public discourse are the primary tools that can help identify and resolve issues related to future forest conditions and uses in the South.

Needs for Additional Research

The valuation of public goods provided by private forests in the South is an area of research that has not been explored but is clearly needed. This research needs to identify values associated with forest land use and land use change across various strata including forest type, geographic location, and population density. For example, concern has been raised in the South about the impact that timber harvesting and intensified forest management may have on forest landscapes and how such changes impact the provision of public goods and forest amenities from private forests. The degree of concern about timber harvesting and intensified forest management may not be evenly spread across people living in the South. A better understanding of who is concerned about the intensification of forest management, why they are concerned, where they are concerned, and how much they are concerned will help develop meaningful communication between citizens and policymakers.

A better understanding of forest values produced by private forest land could then be used to assess which areas in the forest landscape would provide the greatest contributions to sustainable economic growth and development. Any attempt to increase the quality of life in forest environments must consider the full spectrum of forest uses from natural forests to plantations. Further research can help provide relevant information to local, regional, State, and Federal agencies with the intent of designing land management plans that are in keeping with the values and goals of all people living in the South.

Another area of research that is needed is to develop a better understanding of the dynamics of economic development in communities with forest related industries. The dynamic relationships between forest related industries in the South and prevalent social and economic conditions are generally unknown and cannot be easily determined. However, it appears that areas with high concentrations of timber-based industries and areas with high concentrations of forest related recreation employment face different paths of economic development. This is typified by a disparity in rates of population growth and economic and social indicators between the timber-based and recreation-based forest sectors. Identifying obstacles to and opportunities for quality growth in forested communities in the South is an important research endeavor.

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Literature Cited

American Forest & Paper Association. 1994. Closer look—an on-the-ground investigation of the Sierra Club's book, Clearcut. Washington, DC: American Forest & Paper Association. 28 p.

Anderson, J.E. 1991. A conceptual framework for evaluating and quantifying naturalness. Conservation Biology. 5: 347–352.

Arrow, K.J. 1983. Social choice and justice. Cambridge, MA: Harvard University Press, Belknap Press. 229 p.

Backiel, A.; Gorte, R.W. 1992. Clearcutting in the national forests. Washington, DC: Congressional Research Service Report for Congress. National Council for Science and the Environment: Washington, DC. 26 p. http://www.cnie.org/nle/crsreports/forests/for-2.cfm. [Date accessed June 2001].

Bayless, M.; Bayless, S. 1982. Current quality of life indicators: some theoretical and methodological concerns. American Journal of Economics and Sociology. 41: 421–437.

Beale, C.L.; Johnson, K.M. 1998. The identification of recreational counties in nonmetropolitan areas of the U.S.A. Population Research and Policy Review. 17: 37–53.

Boyer, R.; Savageau, D. 1981. Places rated almanac. Chicago: Rand McNally. [Number of pages unknown].

Boyle, K.J.; Holmes, T.P.; Teisl, M.F.; Roe, B. 2001. A comparison of conjoint analysis response formats. American Journal of Agricultural Economics. 83: 441–454.

Boyle, K.J.; Teisl, M.F. 1999. Public preferences for timber harvesting on private forest land purchased for public ownership in Maine. Misc. Rep. 414. Orono, ME: Maine Agricultural and Forest Experiment Station. 18 p.

Cobb, C.; Halstead, T.; Rowe, J. 1995a. The genuine progress indicator: summary of data and methodology. San Francisco: Redefining Progress. [Number of pages unknown].

Cobb, C.; Halstead, T.; Rowe, J. 1995b. If the GDP is up, why is America down? Atlantic Monthly. October. 59–78.

Cook, P.J.; Mizer, K.L. 1994. The revised ERS county typology. Rural Dev. Res. Rep. 89. Washington, DC: U.S. Department of Agriculture, Economic Research Service. [Number of pages unknown].

Cordell, H.K.; Bergstrom, J.C., eds. 1999. Integrating social science with ecosystem management: human dimensions in assessment, policy, and management. Champaign, IL: Sagamore Publishing. [Number of pages unknown].

Crone, L.K.; Haynes, R.W.; Reyna, N.E. 1999. Different perspectives on economic base. Res. Note PNW–RN–538. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 21 p.

Dasgupta, P. 1999. Valuation and evaluation: measuring the quality of life and evaluating policy. Discuss. Pap. 127. Stockholm: Beijer International Institute of Ecological Economics. 69 p.

Deller, S.C.; Tsai, T-H; Marcouiller, D.W.; English, D.B.K. 2001. The role of amenities and quality of life in rural economic growth. American Journal of Agricultural Economics. 83: 352–365.

Devall, B., ed. 1993. Clearcut: the tragedy of industrial forestry. San Francisco: Sierra Club Books/ Earth Island Press. 291 p.

Diener, E. 1995. A value-based index for measuring national quality of life. Social Indicators Research. 36: 107–127.

Driver, B.L.; Brown, P.J.; Peterson, G.L., eds. 1991. Benefits of leisure. State College, PA: Venture Publishing. [Number of pages unknown].

Driver, B.L.; Dustin, D.; Baltic, T. [and others], eds. 1996. Nature and the human spirit: toward an expanded land management ethic. State College, PA: Venture Publishing. [Number of pages unknown].

Easterlin, R. 1974. Does economic growth improve the human lot? Some empirical evidence. In: Nations and households in economic growth. New York: Academic Press. [Number of pages unknown].

English, D.B.K.; Bergstrom, J.C. 1994. The conceptual links between recreation site development and regional economic impacts. Journal of Regional Science. 34: 599–611.

English, D.B.K.; Marcouiller, D.W.; Cordell, H.K. 2000. Linking local amenities with rural tourism incidence: estimates and effects. Society and Natural Resources. 13: 185–202.

Ferriss, A.L. 2000. The quality of life among U.S. States. Social Indicators Research. 49: 1–23.

Freeman, A.M., III. 1993. The measurement of environmental and resource values—theory and methods. Washington, DC: Resources for the Future. 516 p.

Garoogian, R.; Garoogian, A.; Weingart, P.W. 1998. America's top-rated cities: a statistical handbook. Boca Raton, FL: Universal Reference Publications. [Number of pages unknown].

Garrod, G.D.; Willis, K.G. 1997. The nonuse benefits of enhancing forest biodiversity: a contingent rank study. Ecological Economics. 21: 45–61.

Gobster, P.H. 1999. An ecological aesthetic for forest landscape management. Landscape Journal. 18: 56–64.

Haefele, M.; Kramer, R.A.; Holmes, T. 1992. Estimating the total value of forest quality in high-elevation spruce-fir forests. In: The economic value of wilderness: Proceedings of the conference. Gen. Tech. Rep. SE–78. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 91-96.

Hamilton, J.T. 1993. Politics and social costs: estimating the impact of collective action on hazardous waste facilities. RAND Journal of Economics. 24: 101–125.

Hamilton, J.T. 1999. Exercising property rights to pollute: do cancer risks and politics affect plant emission reductions? Journal of Risk and Uncertainty. 18: 105–124.

Holmes, T.P.; Boyle, K.J. 2002. Using stated preference methods to estimate the value of forest attributes. In: Sills, E.O.; Abt, K.L., eds. Forests in a market economy. Dordrecht, The Netherlands: Kluwer Academic Publishers. [Number of pages unknown].

Holmes, T.P.; Kramer, R.A. 1996. Contingent valuation of ecosystem health. Ecosystem Health. 2: 56–60.

Johnson, K.M.; Beale, C.L. 1994. The recent revival of widespread population growth in nonmetropolitan areas of the United States. Rural Sociology. 59(4): 655–667.

Kalbfleisch, J.G. 1985. Probability and statistical inference. New York: Springer-Verlag. 343 p.

Kramer, R.A.; Holmes, T.P.; Haefele, M. 2002. Using contingent valuation to estimate the value of forest ecosystem protection. In: Sills, E.O.; Abt, K.L., eds. Forests in a market economy. Dordrecht, The Netherlands: Kluwer Academic Publishers. [Number of pages unknown].

Krutilla, J.V. 1967. Conservation reconsidered. American Economic Review. 57: 777–786.

Krutilla, J.V.; Fisher, A.C. 1985. The economics of natural environments—studies in the valuation of commodity and amenity resources. Washington, DC: Resources for the Future. 300 p.

Minnesota IMPLAN Group, Inc. 1997. IMPLAN professional social accounting & impact analysis software. Stillwater, MN.

Miringoff, M.; Miringoff, M-L. 1999. The social health of the nation: how America is really doing. New York: Oxford University Press. [Number of pages unknown].

Morgan Quinto Corporation. 1998. State rankings 1998. Lawrence, KS: Morgan Quinto Corporation. [Number of pages unknown].

Mukherjee, R. 1989. The quality of life: valuation in social research. Newbury Park, CA: Sage Publications. [Number of pages unknown].

Niemi, E.; Whitelaw, E. 1999. Assessing economic tradeoffs in forest management. Gen. Tech. Rep. PNW–GTR–403. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 78 p.

Noss, R.F.; Cooperrider, A.Y. 1994. Saving nature's legacy—protecting and restoring biodiversity. Washington, DC: Island Press. 416 p.

Parkins, J. 1999. Enhancing social indicators research in a forest-dependent community. The Forestry Chronicle. 75: 771–780.

Pearse, P.H.; Holmes, T.P. 1993. Accounting for nonmarket benefits in southern forest management. Southern Journal of Applied Forestry. 17: 84–89.

Power, T. 1996. Lost landscapes and failed economies: the search for a value of place. Washington, DC: Island Press. 313 p.

Power, T.M. 1980. The economic value of the quality of life. Boulder, CO: Westview Press. [Number of pages unknown].

Richmond, L.; Filson, G.C.; Paine, C. [and others]. 2000. Non-farm rural Ontario residents' perceived quality of life. Social Indicators Research. 50: 159–186.

Ross, P.J.; Green, B.L. 1985. Procedures for developing a policy-oriented classification of nonmetropolitan counties. Staff Rep. AGES850308. Washington, DC: U.S. Department of Agriculture, Economic Research Service. [Number of pages unknown].

Schallau, C. 1994. The contribution of the forest products industry to rural economies of the Southern Appalachian region. Tech. Bull. 94–4. Washington, DC: American Forest & Paper Association. 52 p.

United Nations Development Program. 1998. Human development report. New York: Oxford University Press. [Number of pages unknown].

Walsh, R.G.; Bjonback, R.D.; Aiken, R.A.; Rosenthal, D.H. 1990. Estimating the public benefits of protecting forest quality. Journal of Environmental Management. 30: 175–189.

Wish, N.B. 1986. Are we really measuring the quality of life? Well-being has subjective dimensions, as well as objective ones. American Journal of Economics and Sociology. 45(1): 93–99.

In: Wear, David N.; Greis, John G., eds. 2002. Southern forest resource assessment. Gen. Tech. Rep. SRS-53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 635 p.

The southern forest resource assessment provides a comprehensive analysis of the history, status, and likely future of forests in the Southern United States. Twenty-three chapters address questions regarding social/economic systems, terrestrial ecosystems, water and aquatic ecosystems, forest health, and timber management; 2 additional chapters provide a background on history and fire. Each chapter surveys pertinent literature and data, assesses conditions, identifies research needs, and examines the implications for southern forests and the benefits that they provide.

Keywords: Conservation, forest sustainability, integrated assessment.